Raven Circuit-Switched

Application Note

2170044
Rev 1.0

SIERRA WIRELESS
HEART OF THE WIRELESS MACHINE®

Circuit-Switched Configuration for the Sierra Wireless AirLink Raven

Step by Step directions for configuring your Raven follow the general information about Circuit Switch. The Step by Step directions use templates for common configurations.

The Raven in PassThru Mode does not have any internal intelligence nor does the Raven C3210, C3216 or N3213 in PassThru Mode have the ability to SAVE individual settings like a conventional modem (the Raven C3211 in PassThru Mode can save settings internally). Therefore, the best machines for use in circuit-switched mode are ones that can provide their own INIT or setup strings and/or issue AT commands.

However, for customers who have unintelligent machines who still need to have the modem 'ready' to behave in a certain way (such as Auto-Answering circuit-switched data calls), there is a feature in the modem called the INIT STATE.

Note: For CDMA, circuit-switched configuration requires a voice plan (account) with your carrier, not a 1xRTT data plan. 1xRTT features are not compatible with the circuit switch configuration. Voice plan speeds are generally lower than those of a data plan.

Note: For iDEN, circuit-switched configuration requires an account/SIM specifically configured for a Circuit-Switched Data (CSD) plan with no restriction on inbound or outgoing calls. A SIM/account provisioned only for standard data options will not work for CSD.

INIT State

The INIT STATE is a state where the modem will initialize itself by using a single pre-determined concatenated Auto-INIT command string. In some models of the Raven, the Auto-INIT is actually an AT command itself, called +ATINIT. Since the Auto-INIT takes the shape of traditional INIT strings, those with experience setting up conventional land-line modems should find this fairly easy to configure.

The Auto-INIT command string is comprised of up to 40 characters, the order defining the sequence of the initialization. The command sets the modem for the desired 'ready' configuration each time it powers on.

Configuring Circuit-Switch

To configure the modem for circuit-switch communication, you will need to use AT commands. To configure the Raven to work in PassThru mode and for circuit-switched communications, you can use AceManager (preferred) or direct serial communication.

Different models of the Raven in PassThru mode respond to some of the AT commands in different ways, a command which is used with one model may not be applicable to another.

Caution: *When the Raven is used for circuit switch, the circuit switch configuration will disable all ALEOS features except for its serial port communication.*

Tip: *The model number of your modem is on the label on the top of the case (example, Raven CDMA C3211).*

AT Commands and command string

Each modem requires a command string that is a combination of AT commands limited to a maximum of 40 characters. The command string will vary depending on the needs of the connected device (for example, some devices need DTR to be high while others need DTR to be ignored). For a full listing as well as parameters and defaults, refer to your Raven User Guide.

Common AT Commands

- **E** Echo
- **Q** Quiet Mode

- **&C** DCD Control
- **&D** DTR Options
- **&S** DSR Options
- **S0** Auto-answer mode
- **S7** Wait for Carrier
- **S8** Comma Pause Time
- **S9** Carrier Detect Response Time
- **+IFC=x,x** Enable or Disable Flow control - RTS/CTS (for C3210, you will need to use a comma replacement command).
- **$QCVAD** Answer as a Data Call for C3210.
- **+CICB** Answer as a Data Call for C3211.

Commands Specific to the Raven Models

For circuit-switched communication, the Raven needs to be configured to enter into PassThru after start up (**MD** in the ***UDP*** group) and needs a command string sent to the modem after it is initialized (***PTINIT** in the PassThru group).

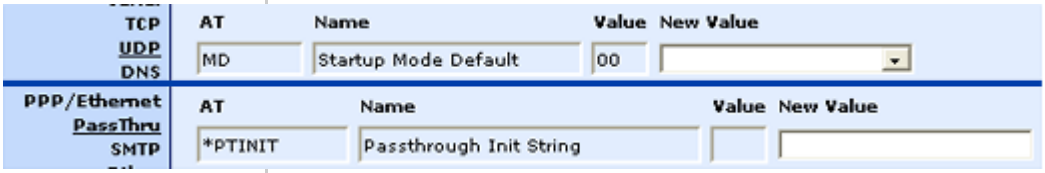


Figure 1: Wireless Ace

ATMD07

AT*PTINIT=**AT***string*

Figure 2: Typed Commands

Caution: *The only commands that can be used in the string are those which do not require ALEOS. All AT Commands beginning with an * (asterix) require ALEOS.*

Raven C3210

The command string cannot contain any spaces, commas, the plus (+) symbol, or a semi-colon (;). If an AT command needed for the string contains a plus or comma (for example, +IFC=0,0), you will need to designate a break character since you cannot use the standard break of ; for the plus to be read and a replacement for the comma. The break and comma designa-

tions need to be at the end of the ATINIT command and separated with commas. During the INIT sequence, the modem looks at the entire command before executing the AT command string. If there are replacement values, it will perform the appropriate replacement before executing the AT command.

Figure 3: Entry Example

Typed: **AT*PTINIT=AT&C1S0=1$QCVAD=4%+IFC=0^0,%,^**

The **%** will allow the **+** to be used and the **^** will translate to a **,**. The AT command executed would be:

Example of executed command:
AT&C1S0=1$QCVAD=4+IFC=0,0

Table 3-1: Raven C3210

The Auto-INIT Command	Components:
AT*PTINIT=AT&D0S0=1$QCVAD=4,%,^	AT All AT commands must start with "AT".
	*PTINIT= Sets the initialization string in the modem.
	AT All AT commands must start with "AT".
	string The string is a combination of AT Commands (refer to your Raven User Guide) limited to a maximum of 40 characters. Examples below.
	[,break] Optional "BREAK" character to allow the use of a command with a "+". In the example, a "**%**" is used.
	[,comma] Optional comma replacement character to allow the use of a command requiring a comma. In the example, a **^** is used.

Raven C3211

AT commands can be concatenated to create a string. Some commands, such as "**+IFC**", will need to be prefixed with "**;AT**".

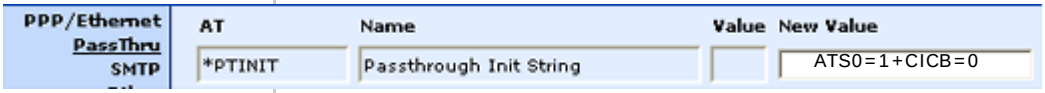


Figure 4: Entry Example

Typed: **AT*PTINIT=ATS0=1+CICB=0**

Example of executed command: **ATS0=1+CICB=0**

Table 4-1: Raven C3211

The Auto-INIT Command	Components:
AT*PTINIT=ATS0=1+CICB=0	AT All AT commands must start with “AT”.
	*PTINIT= Sets the initialization string in the modem.
	AT All AT commands must start with “AT”.
	string The string is a combination of AT Commands (refer to your Raven User Guide) limited to a maximum of 40 characters. Examples below.

Raven N3213

AT commands can be concatenated to create a string.

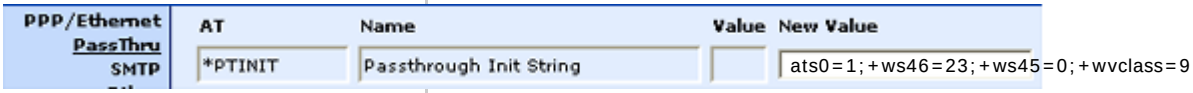


Figure 5: Entry Example: Exemple

Typed:
AT*PTINIT=ATS0=1;+WS46=23;+WS45=0;+WVCLASS=9

Table 5-1: Raven N32131

The Auto-INIT Command	Components:
AT*PTINIT=ATS0=1;+WS46=23;+WS45=0;+WVCLASS=9	AT All AT commands must start with “AT”.
	*PTINIT= Sets the initialization string in the modem.
	AT All AT commands must start with “AT”.
	string The string is a combination of AT Commands (refer to your Raven User Guide) limited to a maximum of 40 characters. Examples below.

Raven LEDs in Circuit-Switched Mode

When the Raven is in Circuit-Switched mode, the LEDs on the front will behave differently. The Chan, Link, and Reg LEDs will flash in tandem, like with PassThru mode, while all other LEDs (except for Power) will be off.

Step by Step Configuration for the Raven

The first thing you need to do is determine the model number of your Raven. Different model numbers will have different configurations. Some of the configuration steps for one model will not work at all with any other model number.

The model number for your Raven is on the sticker which is on the top of the modem (example, Raven CDMA C3210, Raven CDMA C3211, or Raven iDEN N3213). The first letter and number (C3 or N3) indicates the communication technology your modem uses. The next number (2) indicates the modem model (Raven). The final two numbers (10, 16, or 13) indicate the internal hardware model.

Information Required for CDMA *only*

1. **Master Subsidy Lock** (MSL) - also called the Unlock Code or Activation Code. This should be provided by your Wireless Provider. The incorrect MSL can cause the configuration to fail. This might also be programmed for you as part of the Setup Wizard activation process.
2. **MIN and MDN or MSID** - The phone number for your cellular account (also called the MIN). You may have two phone numbers for your modem, the MIN and MDN or MSID. If you have two numbers which are different and you only enter one, the configuration will fail. The MIN and MDN or MSID (if it is different) should be provided by your Wireless Provider
3. **Username** (SID or NID) **and Password** - You may also need a user name and password for your account. The

user name for your account may be the same as your MIN. The user name and password should be provided by your Wireless Provider

Hardware Required

1. A personal computer with a functioning serial port or USB port and a USB to serial converter configured to work with your computer.
2. A straight through RS232 cable (DB9M-DB9F).
3. A suitable power supply and antenna for the Raven modem. Without suitable signal strength the modem will not function. Better than at least -100dBM is required.
4. **For iDEN *only*:** An iDEN SIM specifically provisioned for Circuit-Switched data and has no restrictions on incoming/outgoing calls.

Software

1. **Modem Doctor** - Utility to conduct diagnostics and to bring your modem to a base-level of configuration. You can download Modem Doctor from the Sierra Wireless AirLink Solutions website: http://www.sierrawireless.com. This utility does not need to be installed; it is run directly. Remember where you downloaded it to, so you can run it as part of the instructions below.
2. **AceManager** - Graphical interface for entering most AT Commands. You can download AceManager from the Sierra Wireless AirLink Solutions website: http://www.sierrawireless.com/. A default installation of this utility is assumed later in these directions.
3. **Raven Templates** - AceManager templates for the C3210 and C3211 in both quiet and non quiet configurations and N3213. The templates are provided by your Sierra Wireless AirLink Solutions representative and have a .xml extension. You can also download the appropriate template from: http://www.sierrawireless.com/docs/AppNotes/CircuitSwitchTemplates/. You should only download the template which matches your modem model.
4. **For CDMA *only*:** The **Setup Wizard** for your Wireless Provider. You can download the Setup Wizard from the Sierra Wireless AirLink Solutionswebsite: http://www.sierrawireless.com(select Raven and your Wireless Provider to download the correct Setup Wizard). A

default installation of this utility is assumed later in these directions.

Software Recommended

1. **AceView** - Status and connection monitor for your Raven. You can download AceView from the Sierra Wireless AirLink Solutions website.
2. **AceNet** - Multiple modem configuration and monitoring utility for all AirLink modems. With AceNet, you can save a working configuration in AceManager and then load it into several modems concurrently saving time and ensuring all the modems are configured the same. AceNet is available for separate purchase from your Sierra Wireless AirLink Solutions representative.

Note: The monitoring feature of AceNet is unavailable for Ravens which are currently in Pass-Thru mode.

Configuration Steps

1. Connect the modem to your computer (or USB to serial device connected to your computer) via the RS232 cable and apply power to the modem.

Note: If this is the first time you are activating the modem, skip to step 3 (CDMA) or 4 (iDEN).

2. The Raven should have the internal memory erased to bring the modem to a known starting point without any configuration or account programming.
   a. Start **Modem Doctor**.
   b. Select **Erase the modem's non-volatile data**.

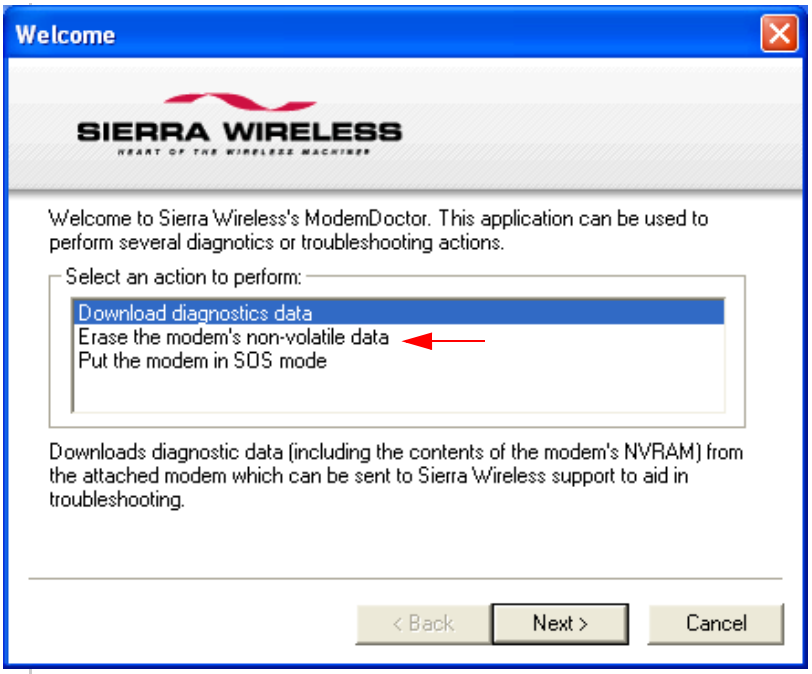
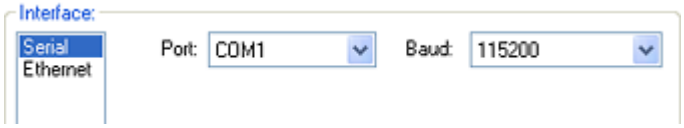

Welcome
SIERRA WIRELESS
Welcome to Sierra Wireless's ModemDoctor. This application can be used to perform several diagnotics or troubleshooting actions.
Select an action to perform:
Download diagnostics data
Erase the modem's non-volatile data
Put the modem in SOS mode
Downloads diagnostic data (including the contents of the modem's NVRAM) from the attached modem which can be sent to Sierra Wireless support to aid in troubleshooting.
< Back
Next >
Cancel

Figure 6: Modem Doctor : Erase memory

c. Select **Serial** from the Interface options and select the Port on your computer to which the Raven is connected. Leave the Baud setting at **115200**.



d. Click the *Next* button and press the modem Reset button when prompted. The modem Reset button is located on the front panel of the modem and can be accessed with the point of a pen or similar tool.

Figure 7: Raven Reset Button

e. Click the ***Exit*** button when the process is complete.

3. **For CDMA *only*:**Using the Setup Wizard, activate the Raven for your cellular account with your Wireless Provider.

   a. Follow the directions in the Quick Start Guide for the Raven and your cellular provider to activate (also called provision) your modem.

   b. Complete the Setup Wizard and verify that the account is good using the Setup Wizard test screen. If your modem fails any of the tests then contactyour cellular provider and troubleshoot the account. Do not proceed until the account is functioning correctly.

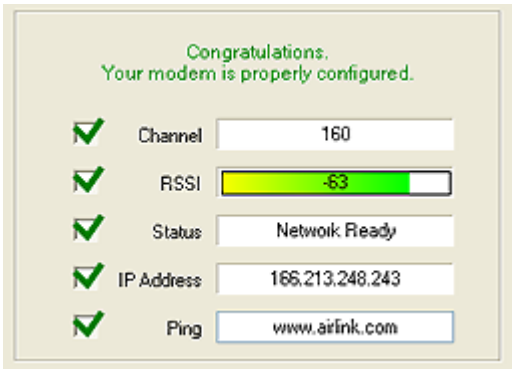


Figure 8: Setup Wizard: Test Modem Setup

For iDEN *only*: Insert the SIM in the Raven iDEN modem and power up the modem. The modem should come up and register on the iDEN network in packet-switched mode as indicated by the illumination of the Reg LED on the front of the modem.

4. Start AceManager: *Start > All Programs > AirLink Communications > AceManager 3G > AceManager 3G*

Click the Connect button. Select **PPP**, **COM1** and enter **12345** for the password and then click ***OK***.

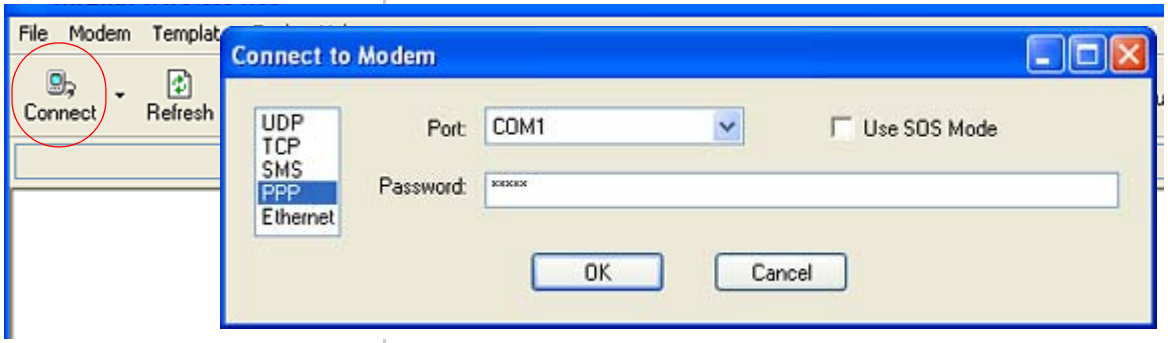


Figure 9: AceManager: Connect

5. Configure the serial port speed.

On the left, under the GROUPS heading, select **Serial**. Change the *MODEMHISPEED setting to "0".

Figure 10: AceManager: Serial Port

6. Save the setting to the modem.

Click the **Write** button on the tool bar of AceManager and wait for the message "Write Successful" to appear in the status bar.

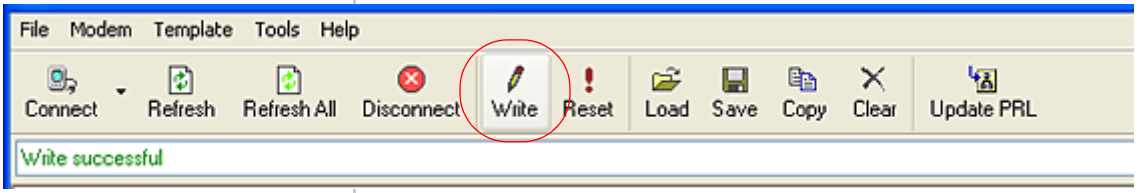


Figure 11: AceManager : Bouton Write

a. Click the **Clear** button and then the **Disconnect** button on the tool bar of AceManager.

Figure 12: AceManager: Clear and Disconnect

b. Press the modem Reset button on the front of the modem. Wait until the modem ***REG*** indicator is lit and then proceed to the next step.

Figure 13: Raven Reset Button

Caution: *Do not proceed to the next step before the **REG** indicator light is lit.*

c. Click the **Refresh All** button on the tool bar of AceManager and wait until all of the modem information is loaded into the AceManager application.

Figure 14: AceManager : Refresh All

Configure the Raven using a AceManager template.

d. Click the **Load** button on the tool bar. Change to the folder (directory) where you downloaded the template(s) and select the template for your modem model and/or preferred mode.

For CDMA *only*: If landline emulation is desired then choose the "non-quiet" template. If direct serial cable replacement is desired then choose the "quiet" template.

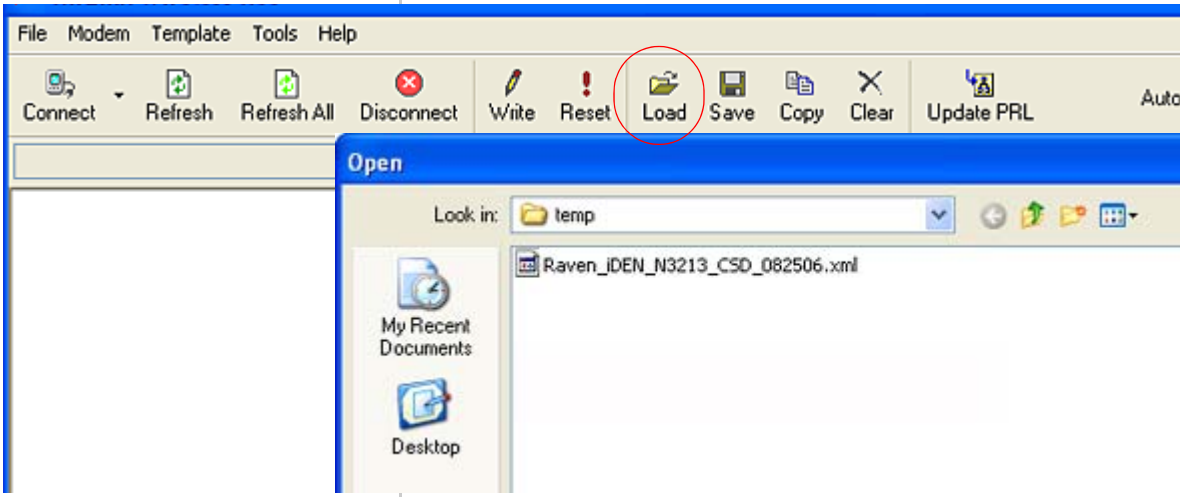


Figure 15: AceManager : Load Template

7. Configure additional PassThru settings.
   a. For ***PTREFRESH**, enter a value of **15**.
   b. For ***RESETPERIOD**, enter a value of **6**.

u

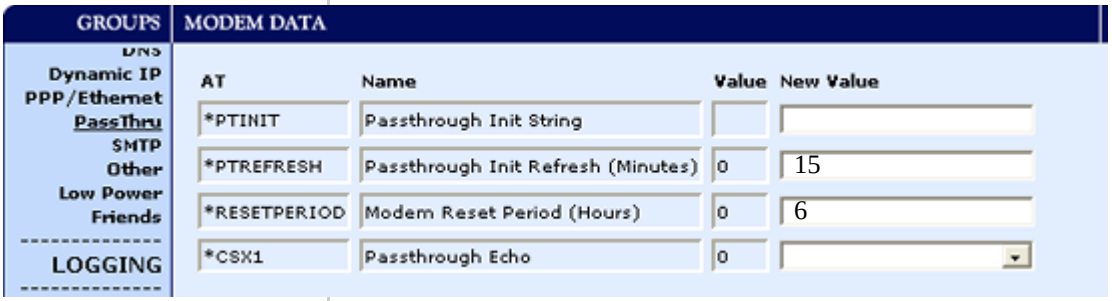


Figure 16: AceManager : PassThr

8. Save the setting to the modem.
   a. Click the **Write** button on the tool bar of AceManager and wait for the message "Write Successful" to appear in the status bar.

Figure 17: AceManager: Write

9. Configure the Raven for your equipment.

Make any appropriate changes to the serial port parameters to match your equipment. These changes are made under the group option **Serial**.

Caution: *Do not under any circumstances change the *MODEMHISPEED setting from the template configuration, the only recommended setting to change is the **S23** setting.*

Follow the directions above to **Write** the changes to the modem.

10. Reset the Raven.

    a. Click the **Disconnect** button on the tool bar of AceManager.

Figure 18: AceManager: Disconnect

    b. Press the modem Reset button on the front of the modem. Wait until the modem ***REG*** indicator is lit and wait approximately 2 minutes to make sure all parameters are written and the modem has once again registered on the network.

11. Disconnect the Raven from your computer.

Testing the Raven Configuration

Once the modem has been activated and you've built the command string it is recommended that the Raven modem be tested previous to field installation.

1. Verify that the modem Chan, Link and Reg indicators are blinking in unison confirming that the modem is now operating in circuit switched (IS-95) mode.

2. **For iDEN *only*:** Using a terminal emulation program (HyperTerminal) set up for 9600bps, 8 data bits, no parity and 1 stop bit, verify the settings in the Raven.

    a. Enter the command: **AT**. If you do not receive a reply of "OK", enter **ATE1** to enable the echo mode.

    b. Enter the command: **AT&V**.

c. Review the settings and confirm that the parameters are correct:

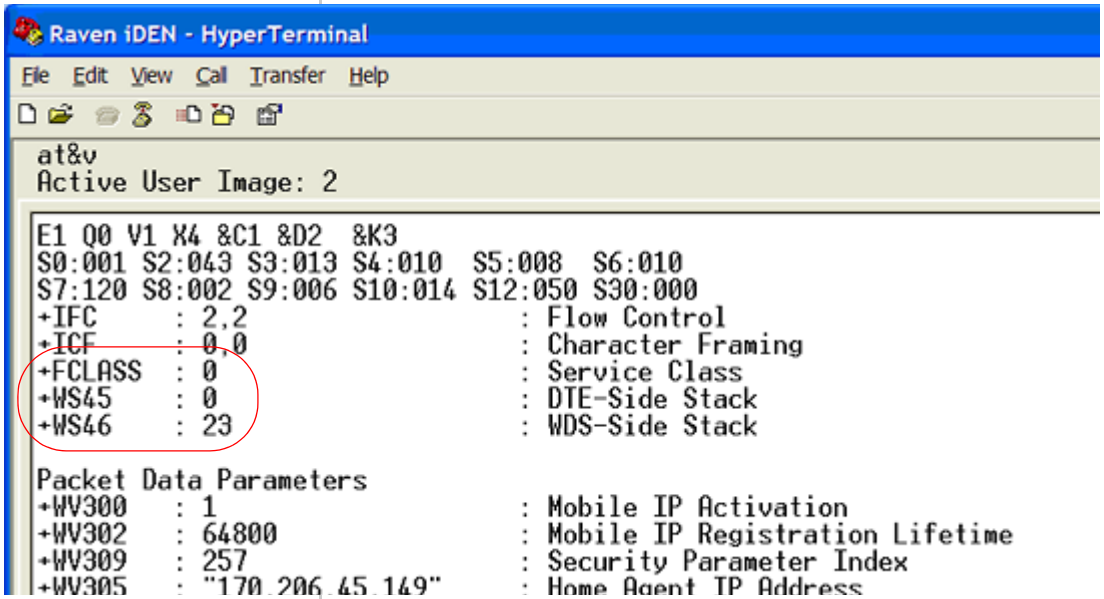

Raven iDEN - HyperTerminal
File Edit View Call Transfer Help
at&v
Active User Image: 2
E1 Q0 V1 X4 &C1 &D2 &K3
S0:001 S2:043 S3:013 S4:010 S5:008 S6:010
S7:120 S8:002 S9:006 S10:014 S12:050 S30:000
+IFC : 2,2 : Flow Control
+ICF : 0,0 : Character Framing
+FCLASS : 0 : Service Class
+WS45 : 0 : DTE-Side Stack
+WS46 : 23 : WDS-Side Stack
Packet Data Parameters
+WV300 : 1 : Mobile IP Activation
+WV302 : 64800 : Mobile IP Registration Lifetime
+WV309 : 257 : Security Parameter Index

Figure 19: HyperTerminal: AT&V

d. Enter the command: **AT+WVCLASS?**. Confirm that a response of "+WVCLASS: 9" is returned.

e. Enter the command: **ATS0?**. Confirm that a response of "001" is returned.

3. Dial the Raven modem telephone number from a land line and verify that the modem automatically answers the call with modem tones.

Note: This test should be completed with the serial cable disconnected to verify that no signaling is required by the modem.

4. Using a terminal emulation program (HyperTerminal) set up for 9600bps, 8 data bits, no parity and 1 stop bit, verify outgoing calls.

Enter the command: **ATD<***phone number***>**. For the **<***phone number***>**, enter a known phone number including the area code for which you can hear ring (such as your office phone).

Commission the Raven Modem on Site

1. The following steps represent a guideline and makes assumptions that the modem has been verified previously in a controlled environment. Install the Raven modem verifying that all power and antenna cables are correctly secured.
2. Verify that the Raven modem powers up and that the Chan, Link and Reg lights blink in unison.
3. Connect the Raven modem to the laptop computer via a straight through RS232 cable or connect the serial cable from the modem to a USB to serial device that has been previously installed on the laptop.
4. **For CDMA *only*:** Using a terminal emulation program (HyperTerminal) set up for 9600bps, 8 data bits, no parity and 1 stop bit, verify the signal strength.

For the Raven C3210: Enter the command: **AT!RSSI?**. This will respond back with a signal strength measurement represented in dBm. The value must be better than -100dBm for the modem to function and it is strongly recommended that -90dBm or better be used as a minimum value.

For the Raven C3211: Enter the command: **AT+CSQ?**. This will respond back with a signal strength measurement represented on a scale from 0-31 and second value separated by a comma. The signal strength value must be higher than 9 for the modem to function and it is strongly recommended that a value of 18 or better be used as a minimum value.

Tip: *You can use the **A/** command to repeat the last AT command.*

5. Remove the connection to the Laptop PC and connect your equipment to the Raven Modem.
6. Have the actual application call your equipment via the modem telephone number and verify communications.

Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

Safety and Hazards

Do not operate the Sierra Wireless modem in areas where blasting is in progress, where explosive atmospheres may be present, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the Sierra Wireless modem **MUST BE POWERED OFF**. The Sierra Wireless modem can transmit signals that could interfere with this equipment.

Do not operate the Sierra Wireless modem in any aircraft, whether the aircraft is on the ground or in flight. In aircraft, the Sierra Wireless modem **MUST BE POWERED OFF**. When operating, the Sierra Wireless modem can transmit signals that could interfere with various onboard systems.

Note: Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. Sierra Wireless modems may be used at this time.

The driver or operator of any vehicle should not operate the Sierra Wireless modem while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some states and provinces, operating such communications devices while in control of a vehicle is an offence.

Limitation of Liability

The information in this manual is subject to change without notice and does not represent a commitment on the part of Sierra Wireless. SIERRA WIRELESS AND ITS AFFILIATES SPECIFICALLY DISCLAIM LIABILITY FOR ANY AND ALL DIRECT, INDIRECT, SPECIAL, GENERAL, INCIDENTAL, CONSEQUENTIAL, PUNITIVE OR EXEMPLARY DAMAGES INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR

REVENUE OR ANTICIPATED PROFITS OR REVENUE ARISING OUT OF THE USE OR INABILITY TO USE ANY SIERRA WIRELESS PRODUCT, EVEN IF SIERRA WIRELESS AND/OR ITS AFFILIATES HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES OR THEY ARE FORESEEABLE OR FOR CLAIMS BY ANY THIRD PARTY.

Notwithstanding the foregoing, in no event shall Sierra Wireless and/or its affiliates aggregate liability arising under or in connection with the Sierra Wireless product, regardless of the number of events, occurrences, or claims giving rise to liability, be in excess of the price paid by the purchaser for the Sierra Wireless product.

Patents

Portions of this product may be covered by some or all of the following US patents:

5,515,013	5,629,960	5,845,216	5,847,553	5,878,234
5,890,057	5,929,815	6,169,884	6,191,741	6,199,168
6,339,405	6,359,591	6,400,336	6,516,204	6,561,851
6,643,501	6,653,979	6,697,030	6,785,830	6,845,249
6,847,830	6,876,697	6,879,585	6,886,049	6,968,171
6,985,757	7,023,878	7,053,843	7,106,569	7,145,267
7,200,512	D442,170	D459,303		

and other patents pending.

This product includes technology licensed from: QUALCOMM® 3G

Licensed by QUALCOMM Incorporated under one or more of the following United States patents and/or their counterparts in other nations:

4,901,307	5,056,109	5,101,501	5,109,390	5,228,054
5,267,261	5,267,262	5,337,338	5,414,796	5,416,797
5,490,165	5,504,773	5,506,865	5,511,073	5,535,239
5,544,196	5,568,483	5,600,754	5,657,420	5,659,569
5,710,784	5,778,338			

Manufactured or sold by Sierra Wireless or its licensees under one or more patents licensed from InterDigital Group.

Licensed under the following Nortel Networks Limited patents:

United States patent numbers: 5128925, 5398247

France patent numbers: 2665993, 2653959, 2659812, 2745091

AirLink Solutions

If you encounter problems with operation of your AirLink wireless gateway, Sierra Wireless product, the support staff of Sierra Wireless AirLink Solutions can help.

Caution: *The configuration suggestions offered in this guide are not supported nor is any equipment other than Sierra Wireless products. Only the operation of the modem or software obtained directly from Sierra Wireless is supported.*

Refer to the User Guide for your modem or the Sierra Wireless AirLink Solutions website for Sierra Wireless product warranties.

Copyright

©December 30, 2008 Sierra Wireless. All rights reserved.

Trademarks

AirCard® and "Heart of the Wireless Machine®" are registered trademarks of Sierra Wireless. Watcher® is a trademark of Sierra Wireless, registered in the European Community. Sierra Wireless, the Sierra Wireless logo, the red wave design, and the red-tipped antenna are trademarks of Sierra Wireless.

"AirLink," "ALEOS," and "AceWare" are trademarks of Sierra Wireless.

Windows® is a registered trademark of Microsoft Corporation.

QUALCOMM® is a registered trademark of QUALCOMM Incorporated. Used under license.

Other trademarks are the property of the respective owners.

Contact Information

Support Desk:	Phone:	1-877-231-1144
	Hours:	5:00 AM to 5:00 PM Pacific Time, Monday to Friday, except US Holidays
	E-mail:	support@sierrawireless.com
Sales Desk:	Phone:	1-510-624-4200 1-604-232-1488
	Hours:	8:00 AM to 5:00 PM Pacific Time
	E-mail:	MobileandM2Msales@sierrawireless.com

Post:	Sierra Wireless America 39677 Eureka Drive Newark, CA USA 94560 Sierra Wireless 13811 Wireless Way Richmond, BC Canada V6V 3A4
Fax:	1-510-624-4299 1-604-231-1109
Web:	www.sierrawireless.com

Consult our website for up-to-date product descriptions, documentation, application notes, firmware upgrades, trouble-shooting tips, and press releases:

www.sierrawireless.com